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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/822,691

04/13/2004

Takashi Noguchi

OKI 419

5003

7590

09/25/2006

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EXAMINER

NGUYEN, JOSEPH H

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 09/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/822,691

Applicant(s)

NOGUCHI, TAKASHI

Examiner

Joseph Nguyen

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 August 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-19, 34 and 37-42 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9, 11-14, 16-19, 34 and 37-40 is/are rejected.
- 7) ☒ Claim(s) 10, 15, 41 and 42 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Claim Objections***

Claims 41-42 are objected to because of the following informalities:

In claims 41-42, line 2, the word "then" should be corrected to read, "than".

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-9, 13-14, 17, 20 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Urushima (US 6,791,195) in view of Ohsawa et al. (US 6194778).

Regarding claims 1-2, 20 and 37, Urushima discloses in figure 6 a heat radiation structure of a semiconductor device comprising a substrate 14 (col. 18, line 16) having on a surface thereof, a first area on which the semiconductor device 3 is mounted, and a second area which surrounds the first area; and the semiconductor device having a first surface and a second surface opposite to the first surface, the second surface having a periphery, the semiconductor device additionally having a plurality of terminals 21 (col. 15, line 14) provided on the first surface, wherein the semiconductor device is mounted on the substrate in such a manner that the first surface is opposite to the

surface of the substrate, and wherein a first heat radiating film (left and right side portions of elements 30) is disposed on the second area of the substrate, and a second heat radiating film (central portion of element 30) is disposed on the second surface of the semiconductor device but does not extend beyond the periphery of the second surface with the second heat radiating film 30 being spaced away from the first heat radiating film. It is noted that element 14 is an interposer, which can function as substrate.

Urushima does not disclose the second heat radiating film (or heat radiating film for claim 2) having a peripheral edge and a rear side exposed to air. However, Ohsawa et al. discloses in figure 7 the second heat radiating film 18 (col. 7, line 23) having a peripheral edge and a rear side exposed to air. It is noted that the semiconductor device as shown in figure 7 will be mounted on the circuit board as shown in figure 17 (col. 15, lines 5-8). As such, the semiconductor device is formed on a substrate (circuit board).

In view of such teaching, it would have been obvious at the time of the present invention to modify Urushima by including the second heat radiating film (or heat radiating film for claim 2) having a peripheral edge and a rear side exposed to air to obtain a more effective heat dissipation in a semiconductor device because heat can be dissipated directly to air.

Regarding claims 3 and 5, Urushima discloses in figure 6 the substrate 14 is provided with external electrodes 31 connected to an external board, and the external electrodes 31 formed on the back of the substrate.

Regarding claim 4, Urushima discloses in figure 11A the semiconductor device 3 is mounted on the substrate in plural form.

Regarding claim 6, Urushima discloses in figure 6 wirings 15 are formed on the surface of the substrate 14, and the terminals 21 of the semiconductor device and the wirings of the substrate are electrically connected to one another.

Regarding claim 7, Urushima discloses in figure 6 the semiconductor device includes a semiconductor element 3 formed with an electronic circuit (i.e. elements 16, 21) and a resin layer 22 formed on the semiconductor element and the terminals 21 are formed on the resin layer. It is noted that element 22 functions to protect the surface of the semiconductor device 3 (col. 21, lines 62-63). As such, element 22 can function as a resin.

Regarding claim 8, Urushima discloses in figure 6 the surfaces of the first and second heat radiating films 30 are exposed.

Regarding claim 9, Urushima discloses in figure 6 wirings 15 are formed on the surface of the substrate 14, and the first heat radiating film 30 is formed so as to cover the wirings.

Regarding claim 13, Urushima et al. discloses on figure 6 substantially all the structure set forth in the claimed invention except the thickness of each of the first and second heat radiating films being from 30  $\mu\text{m}$  to 200  $\mu\text{m}$ . However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Urushima et al. by having the thickness of each of the first and second heat radiating films being from 30  $\mu\text{m}$  to 200  $\mu\text{m}$ , since it has been held that where the general

conditions of a claim are disclosed in the prior art discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding claims 14 and 17, Urushima discloses in figure 6 the first and second heat radiating films 30 comprise a common material, and a thermal emission film having thermal radiation is used for the first and second heat radiating films.

Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Urushima and Ohsawa et al. in view of Chu et al. (US 5,168,348).

Regarding claim 11, Urushima and Ohsawa et al. disclose substantially all the structure set forth in the claimed invention except openings defined in the second heat radiating film and parts of the second surface of the semiconductor device exposed through the openings. However, Chu et al. discloses in figure 3 openings (holes between elements 114) defined in the second heat radiating film 114 (col. 5, lines 8-11) and parts of the second surface of the semiconductor device 102 (col. 4, line 64) exposed through the openings. In view of such teaching, it would have been obvious at the time of the present invention to modify Urushima et al. and Ohsawa et al. by having openings defined in the second heat radiating film and parts of the second surface of the semiconductor device exposed through the openings to enhance convective cooling performance on the semiconductor device (col. 3, lines 28-30, Chu et al.).

Regarding claim 12, Chu et al. discloses in figure 3 a seal 112 (col. 5, line 5) is applied onto the second surface of the semiconductor device 102, openings are defined in the second heat radiating film 114, and openings are provided such that the seal is

exposed. It is noted that element 112 constitutes a similar structure as the claimed seal and therefore can function as a seal.

Claims 16, 18-19, 34 and 38-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Urushima and Ohsawa et al. in view of Aoki et al. (US 2003/0037866).

Regarding claim 16, Urushima et al. and Ohsawa et al. disclose substantially all the structure set forth in the claimed invention except a film having an insulating property used for the first and second heat radiating film. However, Aoki et al teaches in para [0021], lines 1-6 the heat radiating film can be formed of silica alumina ceramic, which comprises an insulating property. In view of such teaching, it would have been obvious at the time of the present invention to modify Urushima et al. and Ohsawa et al. by having a film having an insulating property used for the first and second heat radiating film to obtain an effective heat dissipation because ceramic is a good, cheap heat conductive material.

Regarding claims 18, 34 and 38-40, Aoki et al. teaches in para [0021], lines 1-6 the material for the first and second heat radiating is ceramic.

Regarding claim 19, Aoki et al. teaches in para [0021], lines 1-6 the material for the first and second heat radiating is silica alumina ceramic.

### ***Allowable Subject Matter***

Claims 10, 15, 41 and 42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The reference (s) of record do not teach or suggest, either singularly or in combination at least the limitation of "openings are defined in the first heat radiating film, and parts of the surface of the substrate are exposed through the openings" for claim 10; "the first heat radiating film and the second heat radiating film are different in thermal expansion coefficient" for claim 15; "the first heat radiating film is thinner than the semiconductor device, and has a rear side that is exposed to air" for claims 41 and 42.

### ***Response to Arguments***

Applicant's arguments filed on 08/22/2006 have been fully considered but they are not persuasive.

With respect to claims 1,2 and 37, applicant argues Urushima's element 30 is just paste that transfers heat to a heat spreader 32, which dissipates the transferred heat directly into the air, and as such Urushima does not disclose, "a second heat radiating film whose rear side is exposed to air" as recited in now amended claims 1, 2 and 37. However, paste 30 is a heat radiation paste, which can function as "heat radiation film". On the other hand, Ohsawa et al. discloses in figure 7 the second heat



radiation film 18 has a peripheral edge and a rear side that are exposed to air. This is structurally similar to the second heat radiating film 300a, which has a peripheral edge and a rear side that are exposed to air as shown in figure 1 of the instant application. Also, applicant argues the regions of paste 30 as shown in figure 6 of Urushima are exposed well above Urushima's interposer 14, not on the interposer 14 as claimed. However, pastes 30 are above and on the interposer 14 because claims 1,2 and 37 do not require the second heat radiation film be directly on the second surface of the semiconductor device. Further, applicant argues the peripheral edge of Urushima's paste 30 appears to be exposed to air and as such there is no need to modify Urushima in view of Ohsawa et al. However, nowhere does Urushima teach the peripheral edge is exposed to air. It is more likely heat spreader 32 is exposed to air. Lastly, with further respect to claim 2, applicant argues Urushima does not disclose a heat radiating film is disposed on a second surface of the semiconductor device without extending beyond the periphery of the second surface. However, Urushima clearly discloses in figure 6 a heat radiation film 30 is disposed on the second surface (left or right surface of element 30) of the semiconductor device without extending beyond the periphery of the second surface.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

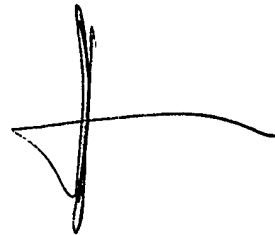
### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Nguyen whose telephone number is (571) 272-1734. The examiner can normally be reached on Monday-Friday, 7:30 am- 4:30 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300 for regular communications.

Art Unit: 2815

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JN  
September 11, 2006.

A handwritten signature in black ink, appearing to read "SPE Kenneth Parker". The signature is stylized with a large, sweeping horizontal stroke and a vertical stroke intersecting it.

SPE Kenneth Parker  
RL 2800